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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/030,232	04/26/2002	Hye-Jeong Kim	678-777 (P9485)	9211
28249	7590	01/25/2006	EXAMINER	
DILWORTH & BARRESE, LLP 333 EARLE OVINGTON BLVD. UNIONDALE, NY 11553			CHOU, ALBERT T	
			ART UNIT	PAPER NUMBER
			2662	

DATE MAILED: 01/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/030,232

Applicant(s)

KIM, HYE-JEONG

Examiner

Albert T. Chou

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 April 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Shirakata et al. (US Patent No. 6,618,352), hereinafter referred to as Shirakata.

Regarding claims 1 and 2, Shirakata teaches an apparatus of compensating for a frequency offset using a pilot symbol for a transmitter in an OFDM system comprising:

a pilot symbol inserter for receiving a spread data symbol stream and inserting a pilot symbol at intervals of predetermined data symbols **[Fig. 16, Data Modulation Portion 201; inserts the pilot carriers PC between the data carriers on the basis of the timing signal Sit; col. 13, lines 46-47];**

a serial-to-parallel (S/P) converter for receiving the pilot symbol-inserted data symbol stream, and outputting N data samples of a symbol unit in parallel **[Fig. 16, Serial-parallel Converting Portion 203; col. 13, lines 27-28];**

an inverse fast Fourier transform (IFFT) section for performing an IFFT operation on the N data samples **[Fig. 16, IFFT Portion 205; col. 13, line 30];**

a parallel-serial (P/S) converter for serializing the IFFT-transformed N data samples and outputting an OFDM symbol **[Fig. 16, IFFT Portion 205, Guard Insertion Portion 207; The IFFT 205 converts the parallel data to the time-domain signal St, the serial signal, by applying inverse Fourier transform; col. 13, lines 56-58];** and

a guard interval inserter for copying a part of the N data samples of the OFDM symbol and inserting the copied data samples in the front of the OFDM symbol **[Fig. 16, Guard Insertion Portion 207; col. 13, lines 30-31].**

Regarding claim 3, Shirakata teaches an apparatus of compensating for a frequency offset using a pilot symbol for a receiver in an OFDM system comprising a carrier synchronizer for compensating for a fine frequency offset using the pilot inserted in the specific pattern out of the IFFT-transformed data symbol stream **[Fig. 9, Phase Correction Unit 11 & Frequency Sync Establishing Unit 104; Fig. 4, Phase Correction Unit 11A; col. 22, lines 6-20].**

Regarding claim 5, Shirakata teaches an apparatus of compensating for a frequency offset using a pilot symbol for a receiver in an OFDM system comprising:

a first carrier synchronizer for receiving an OFDM symbol stream and performing approximate frequency synchronization using the guard interval **[Figs. 9 & 14; Clock Sync Est. Unit 102, col. 2, lines 56-63; Frequency Sync Est. Unit 104, col. 3, lines 1-15; Symbol Sync Est. Unit 106, col. 3, lines 16-30];**

a guard interval remover for removing the guard intervals from the OFDM symbol streams after performing frequency synchronization a first carrier synchronizer for

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receiving an OFDM symbol stream and performing approximate frequency synchronization using the guard interval [Fig. 9; Shirakata does not expressly disclose the guard interval remover in Fig. 9. Shirakata discloses inserting the guard interval using Guard Insertion Portion 207 in an OFDM transmitter in Fig. 16. It is inherent in Shirakata that the OFDM receiver applies an inverse of the OFDM transmitter process to obtain the transmitted information, namely, removing the guard interval using a guard interval remover];

a fast Fourier transform (FFT) section for performing an FFT operation and outputting the data symbol [Fig. 9, FFT 5; col. 22, lines 25-28];

a second carrier synchronizer for compensating for a fine frequency offset using the pilot symbol inserted in the data symbol stream [Fig. 9, Phase Correction Unit 11 & Frequency Sync Establishing Unit 104; Fig. 4, Phase Correction Unit 11A; col. 22, lines 6-20].

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirakata et al. (US Patent No. 6,618,352), hereinafter referred to as Shirakata, in view of Bohnke (US Patent No. 6731594).

Regarding claims 4 and 7, Shirakata teaches an apparatus of compensating for a frequency offset using a pilot symbol for a receiver, wherein the second carrier synchronizers comprises:

a pilot symbol detector for detecting the pilot symbol from the data symbol stream **[Fig. 4, Pilot Carrier Location Detector 8a; col. 16, lines 20--21];**

a phase difference detector for detecting a phase of a pilot symbol and a phase of the delayed pilot symbol and calculating a phase difference between two pilot symbols **[Fig. 4, Phase Difference Calculating Unit 8d; col. 16, lines 52-57];**

an averager for calculating a fine frequency offset by averaging the phase differences received in the frame unit, and outputting a second frequency offset compensation signal according to the fine frequency offset **[Fig. 4, Phase Correction Amt Calculating Unit 8f; col. 18, lines 5-12];** and

a secondary frequency offset compensator for compensating a fine frequency error of the demodulated data symbol according to the second frequency offset compensation signal **[Fig. 4, Data Carrier Phase Correcting Unit 9; col. 18, lines 21-25].**

Shirakata teaches the Pilot Carrier Memory 8c holds in advance information SPC about the transmitted pilot carriers PC to which known complex numbers are assigned on the transmitting end **[Fig. 4; col. 16, lines 9-11]**. Shirakata, however, does not disclose expressly by using a delay means for delaying the pilot symbol by a pilot symbol insertion period.

Bohnke discloses the time/frequency synchronization means of a receiving apparatus for receiving OFDM signals **[Bohnke: Figs. 6 & 7]**. Bohnke discloses a correlator comprising a delay means 32 and a multiplier 35 for the frequency offset detection **[Bohnke: Figs. 6 & 7; col. 6, lines 15-16]**.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the delay means 32 of Bohnke into Shirakata's invention to provide the pilot carrier delayed by the pilot carrier insertion period from the Pilot Carrier Location Detector 8a **[Shirakata: Fig. 4]** instead of holding in advance information SPC about the transmitted pilot carriers in Pilot Carrier Memory 8c **[Shirakata: Fig. 4]** since the delay means and the complex conjugator are well known in the field for years.

The motivation would have been to increase the accuracy of calculating the phase differences between the corresponding samples of the two pilot symbols.

5. Claim 6 rejected under 35 U.S.C. 103(a) as being unpatentable over Shirakata et al. (US Patent No. 6,618,352), hereinafter referred to as Shirakata, in view of Huang et al. (US Patent No. 6,058,101), hereinafter referred to as Huang.

Regarding claim 6, Shirakata teaches a first carrier synchronizer for receiving an OFDM symbol stream and performing approximate frequency synchronization using the guard interval **[Figs. 9 & 14; Clock Sync Est. Unit 102, col. 2, lines 56-63; Frequency Sync Est. Unit 104, col. 3, lines 1-15; Symbol Sync Est. Unit 106, col. 3, lines 16-30]**.

Shirakata does not disclose expressly the first synchronizer comprising a guard interval detector, a copied sample detector, a phase difference detector, an averager and a first frequency offset compensator.

Huang teaches a first synchronization system **[Huang: Figs. 3 and 6]**, which comprises a guard detector **[Huang: Fig. 3; envelop detector 10; col. 5, lines 36-40]**, a copied sample detector **[Huang: Fig. 6, Delay Circuit 72, First Arithmetic Circuit 74 & Multiplication Circuit 76; col. 8, lines 46-48]**, a phase difference detector **[Huang: Figs. 3 & 6; Second Arithmetic Circuit 77, Fractional Frequency Offset Estimation 40]**, an averager **[Huang: Figs. 3 & 6; Average Filter 50]**, and a first frequency offset compensator **[Huang: Fig. 6; Exponential Circuit 78 & Multiplication Circuit 75; col. 9, lines 32-33]**.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to implement a circuit for estimating fractional frequency offset of Huang into Shirakata's invention to perform the approximate frequency synchronization on the received OFDM symbol stream since the fractional frequency offset estimation is based on the introduction of guard interval.



The motivation would have been to provide approximate frequency synchronization on the received OFDM symbol stream prior to the removal of the guard interval and therefore increase the accuracy of calculating fine frequency offset at the second carrier synchronizer.

***Allowable Subject Matter***

6. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent No. 5,953,311 to Davies et al. disclose "TIMING SYNCHRONIZATION IN A RECEIVER EMPLOYING ORHTOGONAL FREQUENCY DIVISION MULTIPLEXING"
- US Patent No. 5,608,764 to Sugita et al. disclose "OFDM SYNCHRONIZATION DEMODULATION CIRCUIT"
- US Patent No. 5,694,389 to Seki et al. disclose "OFDM TRANSMISSION/RECEPTION SYSTEM AND TRASMITTING/RECEIVING APPARATUS"

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- US Patent No. 6,618,452 to Huber et al. disclose "BURST CARRIER FREQUENCY SYNCHRONIZATION AND ITERATIVE FREQUENCY-DOMAIN FRAME SYNCHRONIZATION FOR OFDM"
- US Patent No. 6,510,133 to Uesugi discloses "MULTI-CARRIER TRANSMISSION METHOD AND DATA TRANSMITTER"
- US Patent No. 6,148,045 to Taura et al. disclose "DIGITAL BROADCAST RECEIVER"
- US Patent No. 5,371,761 to Daffara et al. disclose "TRANSMISSION SYSTEM AND RECEIVER FOR THIS SYSTEM"

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert T. Chou whose telephone number is 571-272-6045. The examiner can normally be reached on 8:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571-272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Albert T. Chou

January 17, 2006

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